

A HYDRAULIC CONSTRUCTION OF THE MAMLUK PERIOD AT EL-MADAHIL, NORTHEAST OF THE HULA VALLEY

HERVÉ BARBÉ

During November–December 2004, a salvage excavation was conducted at el-Madahil (map ref. NIG 26078/79016, OIG 21078/29016) following the partial destruction of wall remains during the supervised digging of a trench to accommodate a water pipe.¹ El-Madahil, a registered archaeological site, is located at c. 91.5 m asl on a small, gently sloping basaltic hill on the eastern side of Naḥal Ḥermon, northeast of the Hula Valley (Fig. 1). Naḥal Ḥermon runs c. 500 m west of el-Madahil from north to south at an elevation of slightly less than 88 m asl. The site, which was initially documented during a survey (Shaked 1998:76), was attributed at that time to the end of the Medieval period. The remains of the abandoned village of al-‘Abisiyya are in

the immediate vicinity of the site (Khalidi and Elmusa 1992:429–430).

THE EXCAVATION

The trench opened for the water pipe was c. 1.5 m wide and oriented roughly east–west. Two parallel walls, relatively close to one another, were visible in the southern section of the trench on its eastern end. No remains were visible in the northern section of the trench. Accordingly, an excavation area measuring c. 5.5 × 7.0 m was opened south of the wall remains exposed by the trench. Approximately one meter of surface debris was mechanically removed from the surface. The finds revealed by the excavation are presented in this report

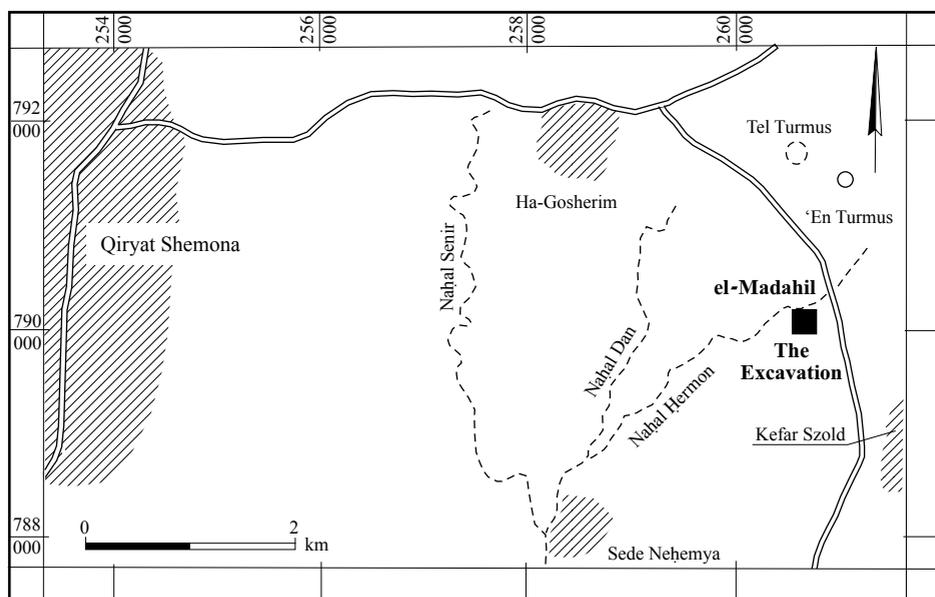
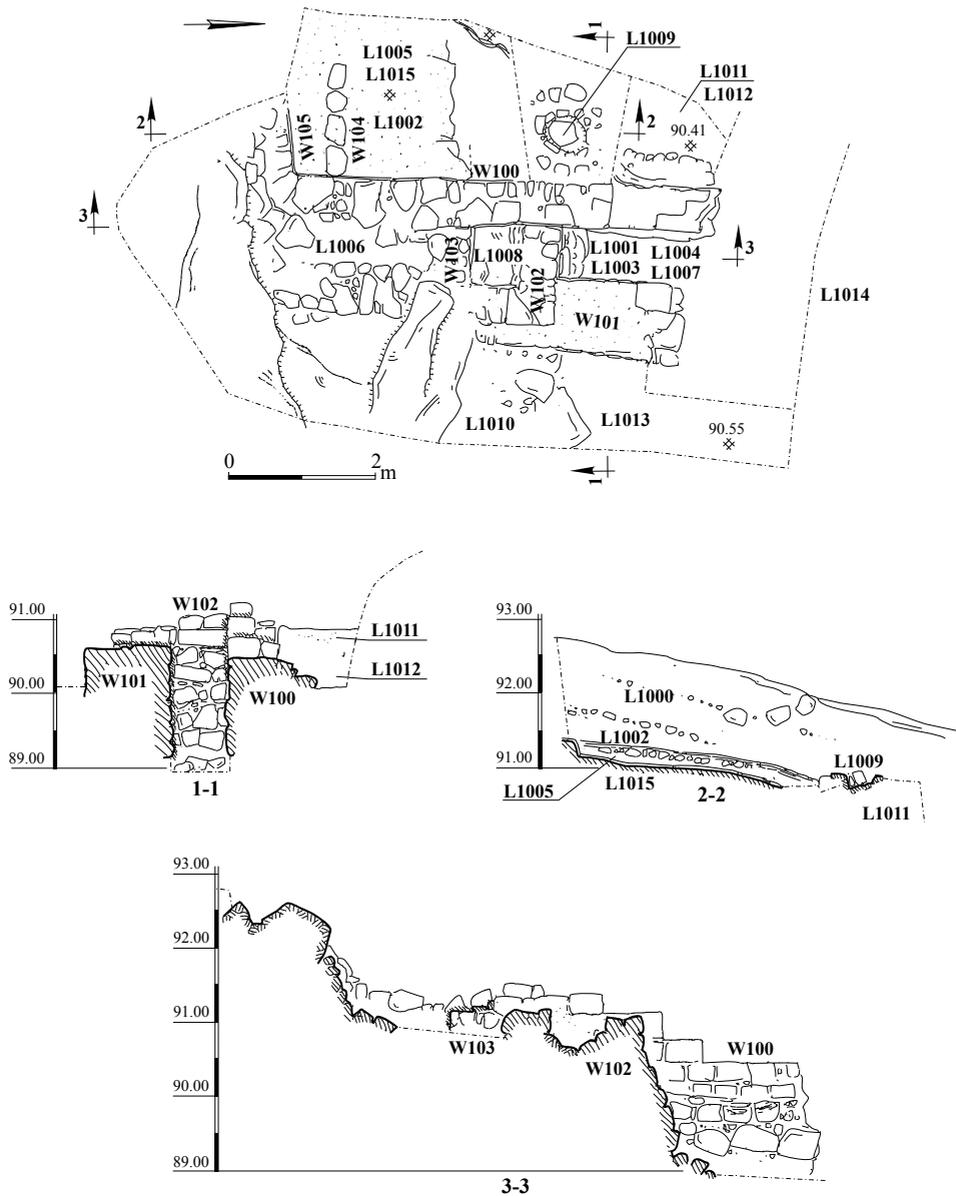


Fig. 1. Location map.



Plan 1. Plan and sections of the remains.

according to phases of construction, occupation, destruction and abandonment.

Construction Phase

The remains unearthed by the excavation were relatively dense for the size of the exposed area (slightly more than 30 sq m). They consisted

of one structure and two related installations (Plan 1; Figs. 2, 3; Table 1). The structure was delimited by two parallel walls oriented north–south (W100 and W101) and a third wall (W102), which ran perpendicular to them, joining with W101 and abutting W100. A circular installation (L1009) was excavated

Table 1. List of Loci

Locus	Stratigraphic Relationship			Description	Date
	Loci Above	Loci Below	Loci at Same Level		
1000		1001/1002		Surface layer	Ottoman and Mamluk
1001	1000	1003		Fill	Ottoman and Mamluk
1002	1000	1005/1006/1008		Fill	Mamluk
1003	1001	1004		Fill	Mamluk
1004	1003	1007		Destruction	Mamluk
1005	1002	1015		Plastered floor	Mamluk
1006	1002			Fill	Mamluk
1007	1004	Sterile clay		Alluvium	Mamluk
1008	1002			Fill	Mamluk
1009	1000	1011		Circular stone installation	
1010	1000	1013		Fill	Mamluk
1011	1000/1009/1015	1012		Fill	Mamluk
1012	1011	Sterile clay	1013	Fill	Mamluk
1013	1010	Sterile clay	1012	Fill	Mamluk
1014				Cleaned section	
1015	1005	1011		Plastered installation and floor	Mamluk

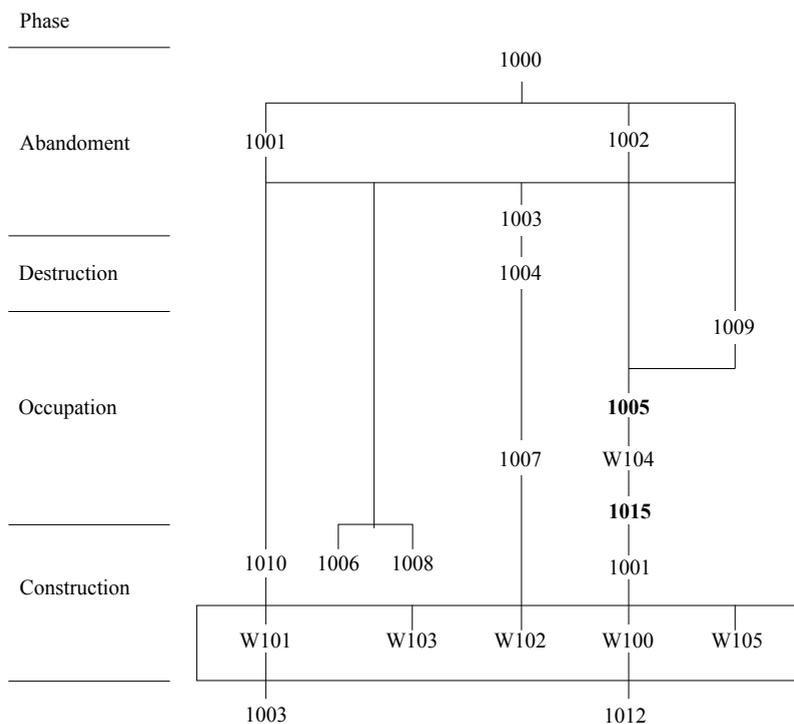


Fig. 2. Schematic diagram of the stratigraphy (floors indicated in bold).

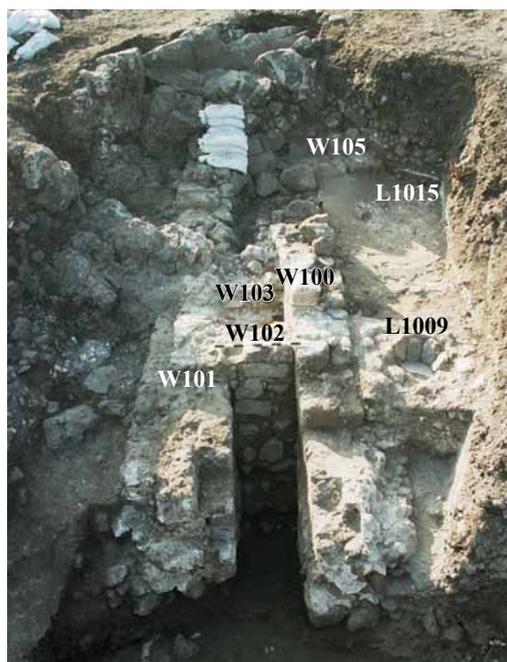


Fig. 3. General view of the site at the conclusion of the excavation, looking south.

west of this structure and another installation (L1015), in the southwestern part of the excavation area.

The southern end of W100 was founded on bedrock, while the northern part was built upon orange-beige clay. It sloped from south to north, and conformed to the natural topography. Only one course survived of the southern portion of W100 (length 5.5 m, width 0.60–0.65 m), while at least four courses were preserved of its northern portion. Overall, W100 consisted of at least seven courses, including foundations, as some of the courses were built to conform to the natural incline of the slope. The southern third of W100, where only a single foundation course (width c. 1 m) resting on bedrock survived, was constructed with roughly cut stones. The northern part was built of solid masonry that incorporated a double row of limestone and basalt stretchers cemented



Fig. 4. Detail of the inner eastern face of W100, looking east; note the concave traces of abrasion.

with whitish lime plaster containing charcoal inclusions; small stones were placed between the stone courses to even out the irregularity in height. The mortar joining the courses of the inner (eastern) face extruded (spilled) onto it, although no attempt seems to have been made to completely cover this face. Traces of a beige concretion (travertine) on some of the stones of this face attest that water flowed along the wall. Some of the stones displayed scratches, in particular one in the second course (Fig. 4), and traces of concavities, which indicate long-term abrasion caused by the action of an apparatus related to water (Plan 1: Section 3–3; see below, Conclusions). Near its southern end, W100 seems to have formed a corner with W105, oriented east–west. Only a small portion of W105 was uncovered.

The southern end of W101 (c. 3 m long) was built on bedrock and consisted of a surviving row of dry-built stones, mainly a 1.2 m wide foundation level. The trench dug for the water pipe had demolished the northern end, which appears to have been more carefully constructed than W100, evidenced by the regularity of the stones of the preserved stretchers forming its inner (western) face. At least seven courses, including a foundation course, were counted. The mortar between the stones of W101 was composed of whitish-beige lime plaster containing charcoal inclusions, similarly to W100.

The space between W100 and W101 was c. 0.7 m wide and closed off to the south by perpendicular W102. This wall was less carefully constructed than W100 and W101 and only its northern face, built of relatively coarsely hewn stretchers and fieldstones, was visible; its southern face rested against bedrock. Seven courses survived of W102 at its western end, all abutting the inner (eastern) face of W100. The five lowest courses of W102 at its eastern end abutted the inner (western) face of W101, while its two upper courses protruded above W101. In contrast to the strictly vertical faces of W100 and W101, the face of W102 inclined somewhat and its upper portion was almost concave.

One meter south of and parallel to W102, a fourth wall was unearthed (W103). The surviving remains of this wall comprised only some fieldstones, exposed at its western end, which were mortared to bedrock and to the eastern face of W100. Remains of mortar that apparently cemented W103 to bedrock at its eastern end provided indirect evidence for the extent of the wall in this direction.

The narrow space (L1008; c. 0.5×0.7 m) defined by W100, W101, W102 and W103 was filled with beige-colored earth containing chalk nodules, small stones and chunks of mortar, all dating from the construction phase. While these walls all rested, at least in part, on a natural floor—bedrock to the south and clay to the north—the northern portions of the western and eastern walls (W100 and W101 respectively) were set into earth fills, which were extensively excavated during the dig. The absence of a foundation trench is characteristic of construction in wet environments. Similar techniques were used in the Middle Ages for drainage of ponds (Barbé 1990:47, Fig. 5). The foundations of W100 and W101 were undoubtedly set into the lower levels of these fills, while the walls were built up against the inner faces of the foundation trench. We therefore conclude that the fills date to the construction phase, if not earlier, as they were exposed below the floor surfaces.

Two loci (L1012, L1013), located on either side of the structure, were defined and partially excavated just outside and adjacent to the structure's western and eastern sides. Resting on natural clay, these loci are situated in a layer of orange-beige silt that contains chalk nodules and some stones. The homogeneity of this sediment, both to the east and west of the structure, provides evidence that this was a single stratigraphic unit cut by the construction of the walls. The top levels of these loci (L1012: 90.41 m asl; L1013: 90.55 m asl) correspond to that of the level between the foundations and the walls. West of the structure, the silt (L1012) is covered by a brown earth fill containing stones (L1011), while to its east, the silt (L1013) is covered by a dense layer of small stones that evokes a bed for the laying of a floor (L1010). This latter layer yielded, in addition to potsherds, a small, polished, conical basalt object that was either a weight or a crusher (see Fig. 12).

In the southwestern part of the excavation area, a plastered installation (L1015) displaying several building stages was uncovered. In its first stage, it abutted the angle formed by the western and southwestern walls (W100 and W105) of the structure west of L1006, and extended 2.3–2.5 m northward and 2.1 m westward from this corner (Fig. 5). Grayish-white lime plaster containing fine charcoal



Fig. 5. The southeastern corner of the structure with floor and plastered walls (L1015), looking southeast.

inclusions coated both the floor and the walls. The plaster coating the walls, each coat 0.5–2.0 cm thick, survived to a total thickness of 0.25–0.30 m. The precise east–west dimensions of the floor were difficult to establish, because its western portion terminated at the section wall of the excavation. However, a length of 2.3 m for the north–south dimensions of the floor from the first construction stage seems reliable as the corner still bore a fragment of wall plaster that abutted the western face of W100.

Occupation Phase

The three main walls (W100, W101 and W102) formed an open space (L1007) below the level of the floor. At the bottom of this space, the wear of flowing water formed a basin-like depression in the natural clay. This depression was filled with beige-colored sandy alluvium rich in aquatic mollusk shells (*Melanopsis*), below the first course of the wall faces. This locus (L1007), the upper level of which corresponds to the bottoms of the three walls, yielded only a few potsherds and 40 iron nails.²

During this phase, two additional layers of plaster were laid upon the original floor of the installation (L1015) north of W105. Another plaster floor (c. 0.20–0.25 m thick) was laid directly upon a layer of brown earth (L1005) during this phase of the installation. This new floor abutted the walls of the original installation, extending at least 0.5 m northward beyond the end of the earlier floor (L1015). Two layers of plaster were laid on this extended floor. The plaster layers ranged from 2–10 mm in thickness, consistent with the natural incline of the slope; all the floors from the various construction stages sloped slightly from south to north.

The last changes to the installation were attested by the presence of a dry-built stone wall (W104) comprising four limestone fieldstones placed on an east–west axis for a length of c. 0.9 m, near the southeastern corner of the original structure. Wall 104 reduced the size of the structure on the south, confirmed

by five layers of plastered floors, all of which abutted the new southern limit of the structure.

Immediately north of Plastered Floor 1005, a small circular installation (diam. 0.5–0.6 m) constructed from small, polished basalt flagstones was uncovered (L1009; Fig. 6); it was set in a small pit. One of these flagstones lay flat at the bottom of the installation, forming the base, while the others stood vertically around it, forming its walls. The shallow inner space (c. 0.3 m deep) was filled with powdery beige sediment that was devoid of finds. The plastered floor (L1005/L1015) and the circular installation (L1009) were embedded in the earth fill (L1011) described above, and rested on the foundations of the western wall (W100) of the earlier structure, abutting its western face.

Destruction Phase

The destruction phase of the site featured a layer of average-sized stones that covered the sandy, beige alluvium rich in *Melanopsis* shells, which had been deposited in the basin-shaped depression in the space (L1007) formed between W100, W101 and W102. We identified this phase as a destruction layer (L1004) because it yielded an unusually large quantity of iron nails (N = 67), suggesting that machinery had been destroyed or dismantled. This phase also yielded other iron objects, as well as a number of potsherds that, despite significant erosion, in some cases could be pieced together.



Fig. 6. Circular installation constructed of small basalt flagstones (L1009), looking east.

Abandonment Phase

Two layers of fill covered all the remains at the site. One, the uppermost part of the fill (L1001, above L1003), in the space between W100, W101, and W102, was excavated manually; it had been deposited on top of the walls in the northern portion of the site and consisted of heterogeneous brown to light beige earth containing chalk nodules and fragments of lime plaster. The lower down this fill was excavated, the fewer artifacts were found, primarily iron nails—nine in L1001 and nine in L1003. The other layer of fill (L1000, L1002), which covered the plaster floors, the dry-stone walls and the bedrock in the southern portion of the site, was much more homogeneous in composition, and consisted of brown to beige earth. The upper portions of these fills, consisting of deposits of a brown humus-like soil (c. 1 m thick), were mostly removed using a mechanical excavator, while their bottom portions were excavated manually (L1000).

THE FINDS

The Pottery

Glazed Wares.— The vast majority of ceramic artifacts unearthed at the site were glazed, mainly monochrome, wares. These wares feature a light green glaze with darker green stains applied over a white slip. The glaze covers the entire inner part of the vessel, in some cases also spilling over the outer edge of the rim and partially covering the external slip, leaving the external slip partially visible. At el-Madahil, this type of glaze is always associated with carinated bowls. Examples were uncovered in the occupation phase (Fig. 8:1), the destruction phase (Fig. 9:2–4) and the abandonment phase (Figs. 10:2; 11:2). This pottery type has parallels in Middle Eastern assemblages dating from the second half of the thirteenth to the fifteenth centuries (Avisar and Stern 2005:12). It was particularly popular during the Mamluk period.

The second type of glazed ware found at the site is essentially a subcategory of the first.

This type also has a monochrome glaze, but the shape of the vessels in particular links the type to parallels from Mamluk contexts at Yoqne'am (Avisar 1996:100, Type 49). The vessels from Yoqne'am are relatively open bowls with a thickened, more-or-less everted rim that were white-slipped and then covered with a green glaze. These vessels date from the fourteenth to the fifteenth centuries (Avisar and Stern 2005:14). By contrast, the open-shaped vessels, from both the construction (Fig. 7:1) and abandonment (Fig. 11:1) phases, are yellow-glazed.

Pottery bearing painted decorations on a white-slipped background and covered with yellow glaze was uncovered in three phases: the construction phase (Fig. 7:2, 3), the occupation phase (Fig. 8:3) and the abandonment phase (Fig. 11:3). This type was dated at Abu Ghosh to between the mid-twelfth and the fifteenth centuries (de Vaux and Stéve 1950:133, 137–138). The type was also uncovered at Emmaus-Qubeibeh, in a context that could be dated with more precision, spanning the mid-twelfth to the mid-thirteenth centuries (Bagatti 1993:119, 143–147). A number of subsequent studies have demonstrated that this pottery type continued into the Mamluk period and beyond (Avisar and Stern 2005:19–21). One vessel from el-Madahil, the base of an oil lamp (Fig. 8:3), is particularly noteworthy; it dates between the mid-twelfth and the thirteenth centuries and parallels have been discovered at nearby Baniyas (Avisar and Stern 2005:124–126).

The third type of glazed ware discovered at el-Madahil, very similar to the type above, is known as Reserved Slip Ware. This type differs from the previous one in that portions of the interior of the bowl are not slipped and therefore, the glaze in these areas appears brown. Possible parallels to this ware from other assemblages have been dated from the thirteenth to the fourteenth centuries (Pringle 1985:179; Avisar 1996:96, Type 46). However, the un-slipped interior portions of the vessels of this type from el-Madahil do not produce the precise geometrical decorations characteristic

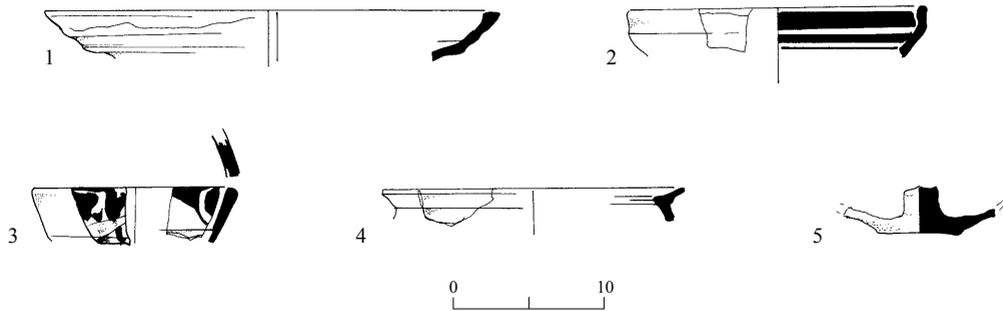


Fig. 7. Glazed and non-glazed pottery from the construction phase.

No.	Vessel	Basket	Locus	Description	Parallels
1	Bowl	10009-1	1008	Light orange-brown clay; white slip on int. and rim under transparent yellow glaze	Avissar and Stern 2005: Fig. 5:1, 2
2	Bowl	10016-1	1013	Dark orange-brown clay; slip-painted decoration on int. under transparent yellow glaze on int. and rim	Pringle 1986: Fig. 50:68 Bagatti 1993: Fig. 31:11-13 Avissar 1996: Fig. XIII-32:4
3	Bowl	10011-1	1010	Light orange-brown clay; slip-painted decoration under transparent yellow glaze on int. and ext.	Bagatti 1993: Fig. 31:10 Avissar 1996: Fig. XIII-33:1
4	Cooking pot	10016-2	1013	Light orange-brown clay, dark inclusions; patches of brown glaze on rim	Stern 1999: Fig. 3:40 Avissar 2005: Fig. 2.18:11
5	Lid	10012-1	1011	Reddish brown clay	Riis and Poulsen 1957: Fig. 972 Avissar 1996: Fig. XIII-109:1

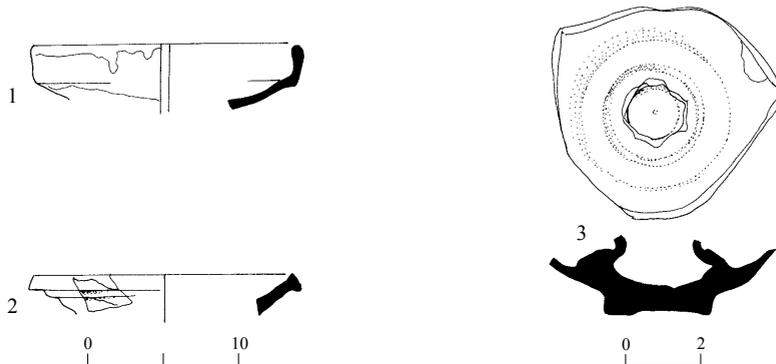


Fig. 8. Glazed pottery from the occupation phase.

No.	Vessel	Basket	Locus	Description	Parallels
1	Bowl	10008-1	1007	Light orange-brown clay; white slip on int. down to carination on ext. under green glaze on int. and rim, splashes of green glaze on ext.	Toueir 1973: Pl. VI:6 Pringle 1984: Fig. 7:42-44 Avissar 1996: Fig. XIII-36:2, 3 Avissar and Stern 2005: Fig. 4:10, 14
2	Cooking bowl	10021-6	1005	Orange-brown clay; purple-brown glaze on int. and rim	Avissar and Stern 2005: Fig. 41:3
3	Oil lamp	10021-1	1005	Orange-brown clay; slip-painted decoration under transparent yellow glaze int. and splashes of glaze on ext.	Tushingham 1985: Figs. 34:40; 35:42 Avissar 2003: Pl. 19 2:21 Avissar and Stern 2005: Fig. 52:3, 4

of the type. Therefore, one cannot rule out the possibility that the vessels reminiscent of Reserved Slip Ware from el-Madahil were not intentionally decorated using this method, but

are the result of the potter's careless application of the white slip. This type was uncovered only in the destruction phase (Fig. 9:1, 5).

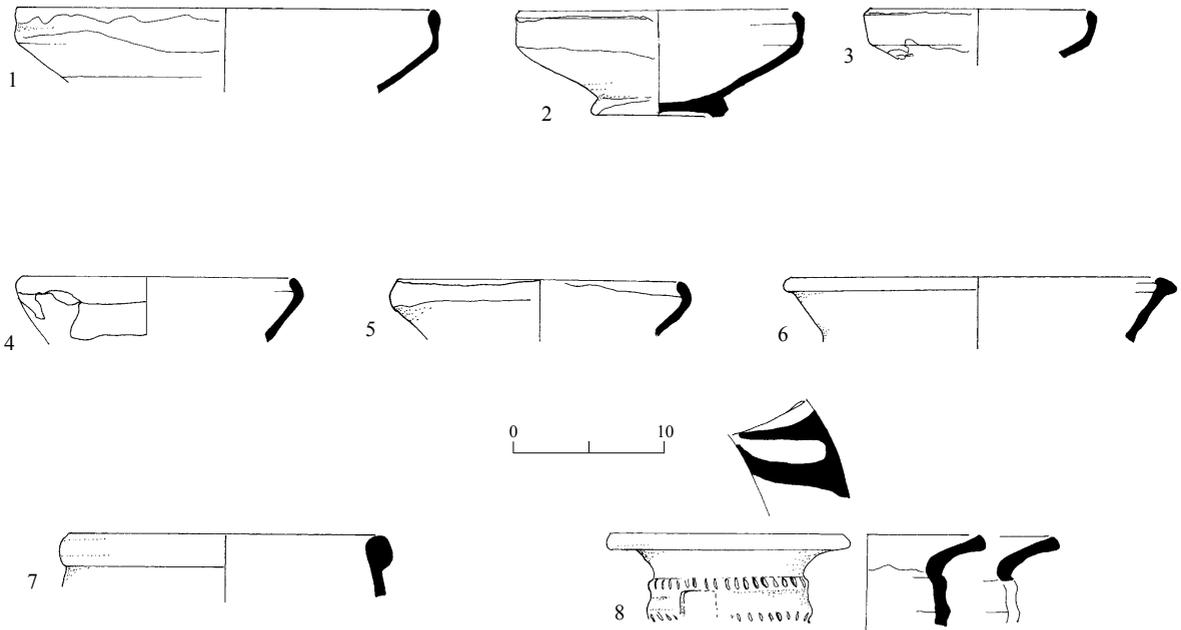


Fig. 9. Glazed pottery from the destruction phase.

No.	Vessel	Basket	Description	Parallels
1	Bowl	10006-1	Light brown clay, gray core; reserved white slip on int. down to carination on ext. under green glaze on int. and rim	Avissar 1996: Fig. XIII-34:2, 4 Stern 1999: Fig. 1:10 Avissar and Stern 2005: Fig. 8:3, 4
2	Bowl	10006-3	Light orange-brown clay; white slip on int. down to carination on ext. under green glaze on int. and rim, splashes of green glaze on ext. and base	Toueir 1973: Pl. VI:6 Pringle 1984: Fig. 7:42-44 Avissar 1996: Fig. XIII-36:2, 3 Avissar and Stern 2005: Fig. 4:10, 14
3	Bowl	10006-13	Light orange-brown clay; white slip on int. down to carination on ext. under green glaze on int. and rim, splashes of green glaze on ext.	Toueir 1973: Pl. VI:6 Pringle 1984: Fig. 7:42-44 Avissar 1996: Fig. XIII-36:2, 3 Avissar and Stern 2005: Fig. 4:10, 14
4	Bowl	10006-12	Light orange-brown clay; white slip on int. and partly on ext. under green glaze on int. and rim	Avissar 1996: Fig. XIII-36:7, 8
5	Bowl	10006-16	Light orange-brown clay; reserved white slip on int. and rim under green glaze on int. and rim	Avissar 1996: Fig. XIII-34:2, 4 Stern 1999: Fig. 1:10 Avissar and Stern 2005: Fig. 8:3, 4
6	Cooking bowl	10006-10	Light orange-brown clay, black, white and red inclusions; greenish brown glaze on int. and rim	Loffreda 1982: Fig. 9:11 Avissar 1996: Fig. XIII-105:2
7	Cooking pot	10006-11	Orange-brown clay, gray core; brown glaze with splashes of greenish-brown glaze on int. and on ext. rim	
8	Closed vessel (incense burner?)	10006-8	Light orange-brown clay, white inclusion; patches of greenish glaze	

The lower layers of the abandonment phase yielded a bowl fragment decorated with external sgraffito (Fig. 10:1). This vessel type, poorly represented at the site and possibly dating to the fourteenth to fifteenth centuries, has parallels from the northern part of the country (e.g., at Baniyas, Zefat, Kefar Naḥum, Giv'at Yasaf and Yoqne'am). The example from el-Madahil is virtually an identical match to a vessel from Baniyas whose external decoration also consists of vertically incised zigzags separated by groups of lines (Avisar and Stern 2005:16–18).

No parallel was found for a vessel of unknown function discovered in the destruction layer (Fig. 9:8). Openings below the rim are reminiscent of those appearing on incense burners of Late Antiquity, but it is also possible that this vessel was a lantern. The fabric is reminiscent of Lebanese Rashaya el-Fukhar Ware, mostly associated with the Ottoman period. However, the type may have begun to appear during the Mamluk period. A number of vessels in an assemblage from the excavations conducted at Zefat Castle may provide evidence for this conjecture. The date of this assemblage was firmly established in the fifteenth century thanks to some imported vessels and a small

hoard of Venetian and Mamluk coins (Barbé and Damati 2004:88).³

Cooking Vessels.— Several types of cooking bowls or pots were unearthed during the excavations. A rim fragment of a cooking bowl with a very open shape (Fig. 8:2) was uncovered in the occupation level. The everted rim had a flattened edge and was coated inside and on the lip with a purple-brown glaze. This vessel has parallels at Yoqne'am, dating to the Frankish period (Avisar 1996:142–143, Type 16).

Recovered from the destruction phase was a cooking bowl with a thick, rounded rim coated with a greenish brown glaze both inside and on the inner part of the top of the rim (Fig. 9:6). A parallel for this bowl was discovered below the destruction levels in the stables at 'Atlit—according to the excavator (Johns 1936:55–56), these destruction levels do not antedate 1291 CE. However, recent numismatic research (Metcalf, Kool and Berman 1999:107) sets the earliest possible date for these layers at 'Atlit to the year 1265. Vessels similar to the el-Madahil bowl were found at Yoqne'am and Kefar Naḥum, where they were attributed to the end of the thirteenth century (Loffreda 1982:422; Avisar 1996:143).

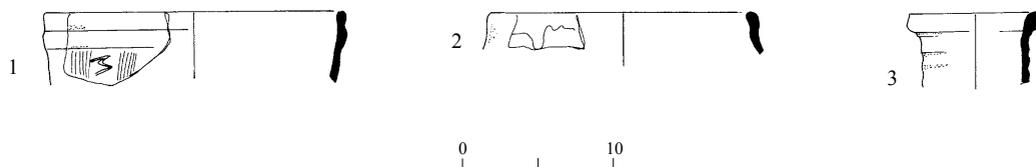


Fig. 10. Glazed and non-glazed pottery from the abandonment phase (lower layer).

No.	Vessel	Basket	Description	Parallels
1	Bowl	10004-1	Light orange-brown clay; white slip on int. and ext., green glaze on int. and ext., sgraffito decoration on ext.	Loffreda 1982: Fig. 9:6 Avisar 1996: Fig. XIII-35:3 Stern 1999: Fig. 3:30 Avisar and Stern 2005: Fig. 6:8, 9
2	Bowl	10004-2	Light brown clay; white slip on int. and rim, dark green glaze on int. and rim	Avisar and Stern 2005: Fig. 4:10–14
3	Jug	10004-3	Light brown clay, many black and white inclusions	de Vaux and Stéve 1950: Pl. G:25 Avisar 1996: Fig. XIII-150:1–3 Lazar 1999: Fig. 6:5

The abandonment phase yielded a cooking-bowl fragment (Fig. 11:4) paralleled by an example from Giv'at Yasaf dated to the end of the thirteenth to the fifteenth centuries (Stern 1999:134). One notable difference, however, is that our fragment is not glazed, while the Giv'at Yasaf example shows traces of glaze on the rim.

Two cooking pots and one lid were also found. The first cooking pot, uncovered in the construction phase (Fig. 7:4), belongs to a type that, because of its presence at Giv'at Yasaf and

Yoqne'am and its absence at Acre, cannot be dated before the fourteenth century (Avisar 2005:63). No parallel was found for the second pot, uncovered in the destruction phase (Fig. 9:7). The lid (Fig. 7:5) was unearthed in the construction phase.

Coarse Ware.—A jug (Fig. 10:3) retrieved from the abandonment phase is similar to examples discovered in Mamluk contexts, particularly at Yoqne'am (Avisar 1996:167). A fragment of an

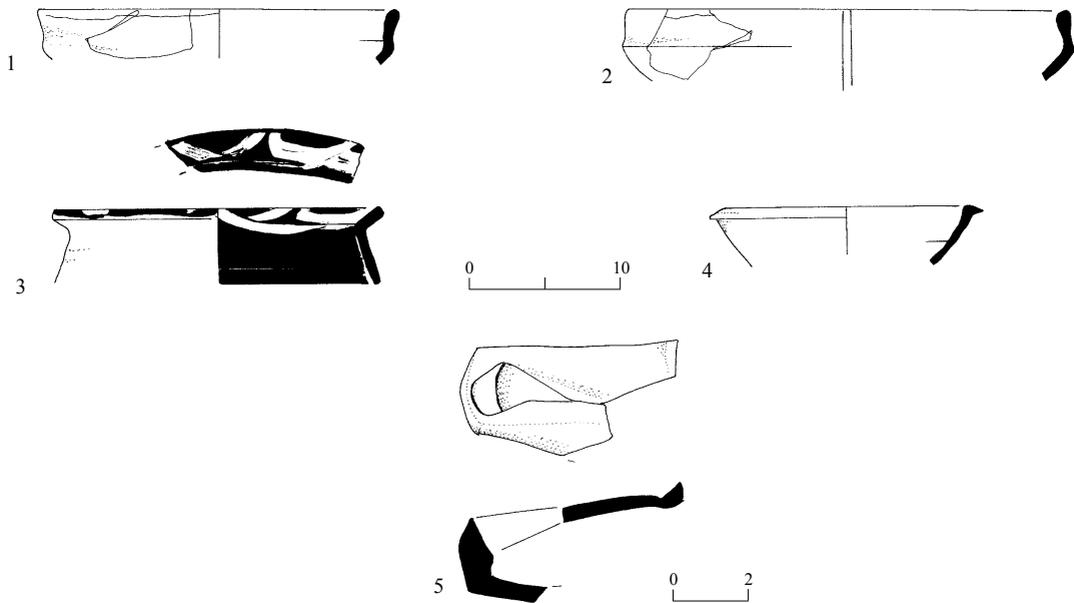


Fig. 11. Glazed and non-glazed pottery from the abandonment phase (upper layer).

No.	Vessel	Basket	Locus	Description	Parallels
1	Bowl	10000-3	1000	Light pinkish clay, dark and white inclusions; white slip on int. and ext., dark yellow glaze on int. and rim	Avisar and Stern 2005: Fig. 5:1
2	Bowl	10000-4	1000	Light brown clay, dark inclusions; slip on int. and down to carination on ext., green glaze on int. and rim	Avisar and Stern 2005: Fig. 4:14
3	Pot	10000-1	1000	Orange brown clay; slip-painted decoration under transparent yellow glaze on int.	Avisar and Stern 2005: Fig. 7:7
4	Cooking bowl	10000-2	1000	Light brown clay, gray core; smoothed ext.	Avisar 1996: Fig. XIII-105:2 Stern 1999: Fig. 3:44
5	Oil lamp	10001-1	1001	Orange-brown clay, many white inclusions	Avisar 1996: Fig. XV-29:32 Avisar and Stern 2005: Fig. 52:5, 6

oil lamp “with a long nozzle” (Fig. 11:5; Avissar and Stern 2005:124) was also discovered in this phase; it is comparable with a type of oil lamp very popular in Fatimid Egypt, where it was produced in a buff fabric. Production of this lamp type continued until the Mamluk period, when an orange-brown fabric, instead of the earlier buff, prevailed. This difference in fabrics provides a reliable indication of the date (Avissar and Stern 2005:128), even though examples of the same orange-brown fabric have also been found in Frankish contexts (Avissar 1996:195). Thus, based on its fabric, the nozzle from el-Madahil is either from the Frankish or the Mamluk period. Whereas known parallels of this lamp type do in fact display traces of glaze, the example discovered at el-Madahil is unglazed.



Fig. 12. Basalt weight or crusher.

Basalt Object

A small, polished conical object (Fig. 12) that was either a weight or a crusher was unearthed from a floor (L1010) in the construction phase.

Iron Nails

More than one hundred forged iron nails, square in section, were found among the stone collapse layer (L1007; the majority of the nails) and in the overlying alluvium (L1004). A group of twelve nails treated in the IAA laboratory revealed at least three different nail types grouped by size and weight (Fig. 13): Type 1 nails ranged in length from 5.84 to 8.28 cm and all weighed less than 20 g; Type 2 nails ranged in length from c. 8 to 10 cm and ranged in weight from 25 to 45 g; and Type 3 nails ranged from approximately 12.5 to 14.5 cm in length and weighed from about 80 to 125 g.

Coins

Three coins were retrieved during the excavation. One coin was a surface find (B10005-1); another was discovered during the cleaning of the northern section of the water-pipe trench (L1014, B10018-1); and the last coin was uncovered at the bottom of the upper layer of building fill (L1000, B10000-1). All three coins date to the Mamluk period, between 1377 and 1399 CE (Table 2).

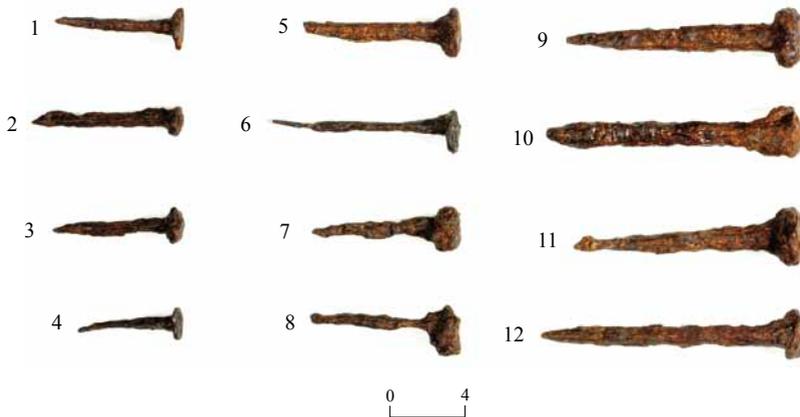


Fig. 13. Nails after treatment, arranged by type.

◀ Fig. 13

No.	Locus	Basket	Length (cm)	Section (cm)	Weight (g)
1	1010	10011-1	5.84	0.62/0.57	13.56
2	1004	10006-6	7.22	0.79/0.78	17.13
3	1003	10004-2	8.28	0.80/0.72	18.49
4	1004	10006-5	6.98	0.78/0.58	19.95
5	1007	10008-2	8.26	0.80/0.72	24.36
6	1004	10006-4	8.12	0.74/0.70	27.74
7	1013	10016-1	10.12	0.60/0.58	29.01
8	1004	10006-3	8.52	0.98/0.96	45.79
9	1003	10004-1	14.49	1.00/0.92	81.75
10	1007	10008-1	12.54	1.20/1.15	93.22
11	1004	10006-1	13.75	1.29/1.29	106.41
12	1004	10006-2	12.85	1.46/1.44	124.31

Table 2. Chronological Distribution of the Mamluk Coins

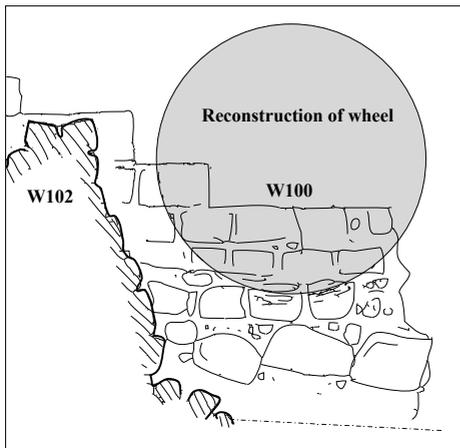
Locus	Basket	Date	References
1000	10000-1	Al-Mansur al-Din Ali, 1377–1381	Balog 1964:234–235, Nos. 501, 502
1014	10018-1	Barquq, 1382–1389	Balog 1964:258, No. 561
Surface	10005-1	Barquq, 1390–1399 (second reign)	Balog 1964:266, No. 590

CONCLUSIONS

Interpreting the Remains

The small size of the excavated area and the relatively short time devoted to the salvage excavation did not enable us to establish with certainty the function of the structural remains. Their arrangement seems to attest to a homogeneous construction that was altered only when the plaster floors were repaired. Evidence hinting at the strong flow of water through the structure is provided by the layer of sandy alluvium containing mollusk shells (L1007) uncovered at the base of the tank-like construction formed by main W100, W101 and W102. Further evidence for prolonged contact with running water is attested by the eroded edges of the pottery sherds uncovered in the destruction phase (L1004). Therefore, it

is likely that this structure operated by means of the driving force of water. This speculation is reinforced by the presence of a travertine deposit on the eastern face of western W100. The scratches of concave wear observed on that same face may very well have been due to the friction caused by the circular motion of a vertical mill wheel (Plan 2). If so, the slope of the southern wall of the tank-like construction (W102) can be attributed to the rotating movement of the wheel: the distance between the edges of the blades and the face of this wall would have had to remain as even as possible to guarantee a regular driving pressure. The water, channeled from upstream, would have been directed toward the site, where the bedrock drops almost 4 m over a length of less than 5 m, which would have certainly been sufficient to provide the force required to drive a mechanical



Plan 2. Reconstruction of vertical mill wheel.

wheel. Following this line of reasoning, both the thickness of the plaster and its coating on the two main walls (W100 and W101) can be explained by the need to resist these hydraulic forces.

The large number of iron nails found in L1007 and L1004 suggests that machinery was destroyed or dismantled. There appear to have been three standards of nails, based on size and weight, as revealed by the examination of the twelve nails in Fig. 13. The evidence seems to support the notion that the structure was constructed of timber, as the fastening of its various elements would have necessitated the use of nails of different sizes and strengths.

However, several factors seem to contradict this interpretation.⁴ First, the wall faces of the structure are not vertical nor are they completely and uniformly coated with plaster, as is usually the case (a-Salam Sa'id and 'Ad 2004:21). Second, the travertine concretions, as well as the traces of abrasive wear, affect only the eastern face of the western wall (W100), and even there, only partially. Finally, the tank-like construction, in which the suggested vertical wheel would have been located, did not have a built floor.

Unfortunately, the northern section of the remains was destroyed by a mechanical

excavator while digging the trench for the laying of the water pipe that resulted in the initial discovery of the structure. It may be that the tank-like construction (W100, W101 and W102) was originally closed by yet a fourth wall to the north, or remained open, thereby confirming the existence of an outlet channel. The cleaning of the northern section of the trench (L1014) did not provide conclusive results.

Dating the Remains

The chronological evidence derived from an examination of the finds, almost exclusively pottery, dates the remains at the site with certainty to the Mamluk period, and confirms the date suggested following the survey conducted prior to the excavation (Shaked 1998:76). The building fill separating the two phases of plastered floors (L1005 and L1015) provides the only sealed context uncovered during the excavations. The relatively few finds discovered *in situ* in this context seem to place activity as early as the thirteenth century (Fig. 8). However, the structure from which these finds were retrieved can only have been built after the depositing of the fill related to the construction phase. As indicated, this fill produced artifacts that have been attributed to the fourteenth or fifteenth centuries (Fig. 7:1, 4). The destruction and abandonment (lower layer) phases do not go beyond the fifteenth century. Only the upper building fills (L1000–L1002), in which Mamluk pottery still dominates, produced some sherds ascribable to Ottoman times. Unfortunately, the few coins discovered at the site did not originate from stratified contexts. However, they date, as do the pottery sherds, to the Mamluk period.

The installation—the nature of which is not entirely understood—was constructed and used in the Mamluk period (fourteenth–fifteenth centuries), more precisely the second half of the fourteenth century, based on the dates of the coins.

NOTES

¹ The excavation (Permit No. A-4298) was directed by the author on behalf of the Israel Antiquities Authority with the participation of Yossi Yaakobi (administration), Vadim Essman and Viatcheslav Pirsky (surveying and drafting), Howard Smithline (field photography), Clara Amit (small finds photography), Natalya Zak (plans), Robert Kool (numismatics), Olga Shor (pottery restoration), Carmen Hersch (pottery drawings) and Raisa Vinitsky (metallurgical laboratory).

² A large number of nails were unearthed at the site, particularly from the lower strata; only 12 nails were treated in the metal laboratory. However, the heads of the nails, some of which were fused together by corrosion, were all numbered. Therefore, the number

of nails cited here represents a minimum number of items.

³ The final study of the finds from Zefat Castle has yet to be published. A description of the architectural remains, dated in part by the coin hoard discovered during the excavations there, will appear in a forthcoming article by the author. Two additional articles will describe further aspects of the finds: the pottery will be described in a study by Edna J. Stern, and the mid-fifteenth century hoard of Venetian and Mamluk silver coins will be discussed by Robert Kool.

⁴ My warm thanks to Dr. Yosef Porath for the valuable remarks he made while visiting the site, which led me to reassess and temper my original conclusions.

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